Earth in Space

Key Concepts

- How does Earth move in space?
- What causes the cycle of seasons on Earth?

The study of the moon, stars, and other objects in space is called **astronomy.** Ancient astronomers studied the movements of the sun and moon. They thought Earth was standing still and the sun and moon were moving. The sun and moon seem to move mainly because Earth is rotating on its **axis,** the imaginary line that passes through Earth's center and the North and South poles. The spinning of Earth on its axis is called its **rotation.** As Earth rotates from west to east, the sun appears to move westward across the sky. **Earth's rotation on its axis causes day and night. It takes Earth about 24 hours to rotate once on its axis.**

The movement of one object around another object is called **revolution.** Earth completes one revolution around the sun once every year. Earth's path as it revolves around the sun is called its **orbit.** Earth's orbit is a slightly elongated circle, or **ellipse**. Earth takes about 365 ¼ days to complete a revolution around the sun, and 12 moon cycles make up fewer days than that revolution.

Sunlight hits Earth's surface most directly at the equator, at an angle of 90°. When the angle is closer to 90°, the sun's rays are more concentrated, and create more heat. Closer to the poles, sunlight hits Earth's surface at an angle. As a result, it is spread out over a greater area and less heat is generated. That is why it is generally warmer near the equator than near the poles.

Earth has seasons because its axis is tilted as it moves around the sun. Earth's axis is tilted at an angle of 23.5° from vertical. As Earth revolves around the sun, its axis is tilted away from the sun for part of the year, and toward the sun for part of the year. When the north end of Earth's axis is tilted toward the sun, the Northern Hemisphere has summer. At the same time, the south end of Earth's axis is tilted away from the sun. As a result, the Southern Hemisphere has winter. The hemisphere tilted toward the sun has more daylight hours than the hemisphere tilted away from the sun. The combination of direct rays and more hours of sunlight heats the surface more than at any other time of the year.

On two days each year, the sun reaches its greatest distance north or south of the equator. Each of these days is known as a **solstice.** On June 21, the sun is at the Tropic of Cancer. This is the summer solstice in the Northern Hemisphere, the longest day of the year. On December 21, the sun is at the Tropic of Capricorn. This is the winter solstice, the shortest day of the year in the Northern Hemisphere. The solstices are reversed in the Southern Hemisphere.

Halfway between the solstices, neither hemisphere is tilted toward the sun. On those two days, the sun is directly over the equator. Each of these days is known as an **equinox,** meaning "equal night." During an equinox, the length of nighttime and daytime are about the same. In the Northern Hemisphere, the autumnal (fall) equinox occurs on September 22, and the vernal (spring) equinox falls on March 21. Like the solstices, the equinoxes are reversed in the Southern Hemisphere.

Name _____ Date_____ Period _____

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This section explains what causes day and night and what causes the cycle of seasons on Earth.

Use Target Reading Skills

As you read about seasons on Earth, stop and write what you know about that topic. As you read the passage, write what you learn.

What You Know
1.
2.
3.
4.

What You Learned
1.
2.
3.
4.

Introduction

1. The study of the moon, stars, and other objects in space is called _____.

Earth in Space *(continued)*

How Earth Moves

Match the term with its definition.

	Term	Definition
____	**2.** axis	**a.** The movement of one object around another object
____	**3.** rotation	**b.** The imaginary line that passes through Earth's center and the North and South poles
____	**4.** revolution	**c.** The path of an object as it revolves around another object in space
____	**5.** orbit	**d.** The spinning motion of Earth on its axis

6. What causes day and night?

_____

_____

7. Each 24-hour cycle, or one roation of Earth is called a(n) _____ .

8. Why is an extra day added to February every four years?

_____

_____

_____

_____

_____

The Seasons on Earth

9. Why is it warmer near the equator than near the poles?

_____

_____

_____

_____

10. Why does Earth have seasons?

_____

_____

_____

11. Circle the letter of each sentence that is true.

- **a.** Earth is closest to the sun when it is summer in the Northern Hemisphere.
- **b.** The hemisphere that is tilted away from the sun has more daylight than the other hemisphere.
- **c.** When it is summer in the Northern Hemisphere it is winter in the Southern Hemisphere.
- **d.** In June, there are fewer hours of daylight and less direct sunlight in the Southern Hemisphere.

12. Each of the two days of the year when the noon sun is farthest north or south of the equator is called a(n) _____.

13. Each of the two days of the year when neither hemisphere is tilted toward or away from the sun is called a(n) _____.

14. Complete the table to show the relationship of Earth's tilt to the seasons in the Northern Hemisphere.

Earth's Seasons in the Northern Hemisphere			
Day in Northern Hemisphere	**Approximate Date Each Year**	**Length of Daytime**	**Hemisphere That Is Tilted Toward the Sun**
Summer solstice	**a.**	Longest day	**b.**
Autumnal equinox	**c.**	**d.**	Neither
Winter solstice	December 21	**e.**	**f.**
Vernal equinox	**g.**	Daytime equals nighttime	**h.**

15. Use the table to circle the letters of the statements that are true about Earth's seasons in the **Northern Hemisphere**.

- **a.** When the Northern Hemisphere has summer, the Southern Hemisphere is tilted away from the sun.
- **b.** In December, the shortest daytime is in the Southern Hemisphere.
- **c.** The autumnal equinox falls on September 22 to mark the beginning of fall in both hemispheres.
- **d.** An equinox occurs on the same days at the same time in both hemispheres.

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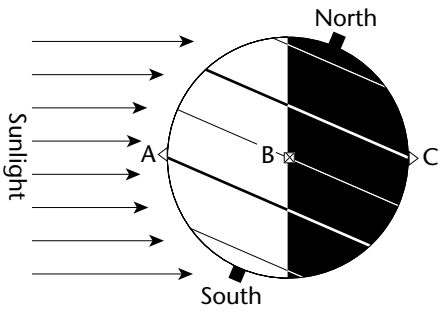
Understanding Main Ideas

Use the following figure to answer questions 1 through 3.



1. In the diagram, what season is it in North America?

2. Would a person at each of the points A, B, and C see the sun? If so, where would the sun be in the sky?

3. Which is a person standing at point B seeing, sunrise or sunset? Explain.

Building Vocabulary

Match each term with its definition by writing the letter of the correct definition in the right column on the line beside the term in the left column.

____ **4.** astronomy

____ **5.** axis

____ **6.** rotation

____ **7.** revolution

____ **8.** orbit

____ **9.** equinox

____ **10.** solstice

a. The path of Earth as it revolves around the sun

b. Line passing through Earth's center and poles

c. The study of the moon, stars, and other objects in space

d. The sun is farthest north or south of the equator at this time

e. Movement of Earth around the sun

f. Movement of Earth around its axis

g. The sun is directly overhead at the equator at this time